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ACCMOD: A SIMPO-I DYNAMIC FLOW MODEL TO PROJECT ENLISTED ACCESSION NEEDS

(10) Pauline T. Olson
Richard C. Sorenson

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ACCMOD: A SIMPO-I DYNAMIC FLOW MODEL TO PROJECT ENLISTED ACCESSION NEEDS

Pauline T. Olson

Richard C. Sorenson, Task Leader

Submitted by:
Cecil D. Johnson, Chief
Statistical Research and
Analysis Division

Approved by:
J. E. Uhlaner, Director
Behavioral Science
Research Laboratory

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Research Studies are special reports to military management. They are usually prepared to meet requests for research results bearing on specific management problems. A limited distribution is made--primarily to the operating agencies directly involved.

FOREWORD

The BESRL Task, "Computerized Models for the Simulation of Policies and Operations of the Personnel Subsystem--SIMPO-I", is conducted by the Statistical Research and Analysis Division. The Task constitutes the initial undertaking of an operations research requirement described in the Army Master Study Program under the title, "A Simulation Model of Personnel Operations (SIMPO)", and is Project 2J050222M711, "Army Operations Analysis," under the auspices of the Army Study Advisory Committee. Subtasks include: a) Operational Analysis of Personnel Subsystem; b) Cataloging and Integration of Existing Manpower Models; c) Development of Measures of System Effectiveness; d) Development of Modeling Techniques; e) Design and Programming of SIMPO-I; f) Application and Evaluation of Computerized Models; and g) Problem Oriented Language for Management.

The effort is closely allied to the SRAD Task, "Optimization Models for Manpower Operations Research," under Army Project 2J024701A732, FY 1968 Work Program. The advantage of pursuing the optimization and simulation research in juxtaposition is that system simulation provides the most efficient and economical means of determining amount of gain and costs of implementing given policy alternatives.

The present publication reports on the development of a simulation model for predicting accession needs for the Army's noncareer personnel subsystems. The model developed, termed ACCMOD, is the third dynamic flow model developed and computerized under BESRL's SIMPO Task.

J. E. UHLANER, Director
U. S. Army Behavioral Science
Research Laboratory

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ACCMOD: A SIMPO-I DYNAMIC FLOW MODEL TO PROJECT ENLISTED ACCESSION NEEDS

BRIEF

Requirement:

To develop a computerized simulation model of the Army's noncareer personnel subsystem for the purpose of predicting required accessions, and to provide instructions for application of the model.

Research Product:

Constraints associated with allowable sequences of assignment and restrictions on the assignment of men nearing the end of their term of obligated service had complicated the problem of projecting noncareer enlisted input requirements two years in advance. These projections were made by hand calculation and required many man hours of work. DYNAMOD, a flexible general simulation model of the Army's rotation system previously developed by BESRL, was considered for use in obtaining the two-year prediction. However, a sufficiently detailed data base was not available, nor was DYNAMOD able to represent adequately some important aspects of the noncareer system. The need remained for a model which would more feasibly accommodate to the needs of the noncareer system.

ACCMOD, the model developed, uses as data base summaries routinely available from the Enlisted Master Tape Record and is capable of the exact accounting of commitment duration necessary for predicting accessions to the noncareer subsystem. Like DYNAMOD and DYROM (a flow model of the career system), ACCMOD uses mass flows between states. Losses, gains, and requirements are simulated, and shifts in state are made at each time step. Each successive step is built on the system as it exists at the end of the previous iteration.

Utilization of the Research Product:

The ACCMOD model has been used to examine the effects of constraints imposed on MOS subsystems by management policy on assignment rotation and by the less than complete deployability of some system members, with the result that some subsystems were found to need more men than expected. Since the twenty-four month projections are made periodically, the model is a useful tool to staff officers.

ACCMOD: A SIMPO-I DYNAMIC FLOW MODEL TO PROJECT ENLISTED ACCESSION NEEDS

Realistic estimation of the number of soldiers required to fill vacancies, replace losses, and support desirable rotation policies while satisfying force commitments in many parts of the world is an essential--and difficult--Army management task. When the estimate of needed additions is based solely on the sum of expected losses and planned system enlargement, it may be impossible to maintain an acceptable rotation policy and at the same time meet combat area requirements. Such manpower rotation constraints as stabilized tours, information lag, and restricted assignments of certain force members give rise to requirements for extra men--requirements that become particularly critical when heavy combat quotas must be met. If additional men cannot be provided to the subsystem, then policy regarding the utilization of available men must be re-evaluated.

It is not easy to recognize an overly constrained system by examining the projection of requirements for men together with the inventory of available men. Nor is the evaluation of alternative policy modifications a straight-forward process. What is needed is some method by which system projection can be made in which movement of men is from area to area, losses and build-up of forces are simulated, and shortages are observed. Manual projections are too slow and too beset by human error to be practical for use in examining the many personnel subsystems in the Army. A computerized flow model which projects the system through time is much less prone to error and saves valuable decision time.

Several dynamic flow models have been computerized by members of the U. S. Army Behavioral Science Research Laboratory SIMPO Task. Three of these models have had operational use by Army and Defense staff agencies: (1) DYNAMOD, a flexible general model, which has been used extensively to model the Army Aviation system; (2) DYROM II, a revised rotation model of the career portion of MOS subsystems; and (3) ACCMOD, a model for predicting accession needs for the noncareer subsystems. All three of these models are still under active development and subject to additions or revision. In order that they may receive further use by management, however, it is necessary to furnish an explanation of the sequence and function of each model, and to provide specific instructions for its application. The present publication is designed to so document ACCMOD.

RESTRAINTS OF THE NONCAREER SUBSYSTEM

The Army enlisted system may be conceptually segmented into two parts, the noncareer subsystem made up of men in their first term of service, and the career system composed of men in later terms of enlistment. ACCMOD is a model of the noncareer subsystem which corresponds roughly to the first four enlisted grades. In these grades there are two categories of personnel--inductees who serve for a total of two years with very few passing into the career subsystem, and enlistees who serve three years and have a higher probability of passing into the career Army.

The input needed to meet the requirements of the combat area while retaining in the system returnees from the combat area who have not yet completed their full period of obligated service depends to some extent on the order in which assignment of MOS personnel to the short tour is effected. If recently acquired trainees are assigned subsequent to the assignment of all available system members who have not yet served in the short tour, fewer new men need be accessioned. If available men already in the system are not assigned to short tour, the chance that they will not serve in short tour during their commitment is high relative to that for new accessions.

At the present time, Army policy does not permit individual replacement to a combat area in the last six months before a man's scheduled release date. Thus, the inductee who spends two months in basic Army training and two or three more months in MOS school has only one year during which he may be given a combat assignment. If he was not needed for immediate short tour assignment when he completed his MOS school training, he probably was assigned to an area other than combat, his availability for short tour assignment having been masked for several months while his records sifted through data processing channels. It is not feasible to reassign certain men--for example, it is scarcely practical to assign a man to a job which he must spend several weeks learning to perform efficiently, and then replace him a month or so later with another who will have to repeat the process of job familiarization. Thus, overall Army performance may be adversely affected by attempting to maximize the probability that all men will serve hardship tours. Accordingly, it is appropriate to recognize that not all men are equally deployable and to make provision for simulating that nondeployability.

In predicting the number of new soldiers required for the next two years, responsible staff agencies have had several sources of information and some computerized accounting methods to help them--more recently, earlier versions of BESRL's simulation models. However, the previous methods did not take into account the problem of maintaining high combat deployment while retaining in the system returnees from combat who have not yet finished their term of service, nor the effect of temporary nondeployability. DYNAMOD could handle both these problems with slight modification, but is not at present capable of the exact accounting of commitment duration necessary for the noncareer system. Additionally, DYNAMOD requires preparation of a fairly detailed data base which is not yet available for most MOS groups. ACCMOD uses the rather gross data base available for summaries routinely obtained from the Enlisted Master Tape Record (EMTR) and prepares the more detailed base in the computer.

APPLICATION OF ACCMOD

ACCMOD data preparation follows procedures developed by members of BESRL's SIMPO Task with the assistance of the Capabilities and Analysis Division, Deputy Chief of Staff for Personnel. These procedures assume a uniform distribution of men month by month within the six-month or one-year interval provided by the EMTR summaries. They provide for assignment of men to short tour at any of three stages: immediately after training and post-training leave, or one year later, or when only one year is left of their commitment.

After the input data inventory has been spread according to these principles, the logic of the model is applied to system parameters and a forward projection is made. These system parameters consist of loss rates covering combat casualities in the short tour and general system attrition estimated from historical information. They include nondeployability rates which reflect (1) the relative extent to which a given MOS is used within the theaters, (2) a gross estimate of assignment probability considering such factors as stabilized tours, status report lag, and other factors affecting easy availability, and (3) hard-core low utility resulting from physical incapacity, compassionate retention in base, or similar reasons. Loss rates are applied by dropping an appropriate number from the system at each iteration. Since, in developing the present model, the mean loss rate was used, all runs with the same data and control cards yield the same results. The outcome estimates expected results over a large number of samples and gives no indication of the range of possible results which might follow from random fluctuations in real system parameter values. But decision whether to retain or drop each man could be made on the basis of generated random numbers, in which case a range of results would be obtained and repeated application of the model would have to be made to estimate an average result.

Temporary nondeployability is simulated by using as short tour replacements only a certain percentage of the men in the assignable categories. Permanent incapacity to serve in the combat area is simulated by holding a proportion of system personnel in a category--or categories--not used for combat replacements. Actual values of the factors used are parameters supplied by the user. The portion of training base output available for short tour assignment can be specified by the program user as a rate of usage of trainees. Thus, needs of other areas for new trainees as replacements can be taken into consideration even though only two tour areas (short tour and rotation base) are specifically simulated in the model.

In obtaining short tour replacement needs, the program user also has the option of going first to training base output and then to sustaining base or preceding in the reverse order, interchanging the two sections of Operation 24 of the computer program.

Data input has been kept comparatively simple, with two control cards per batch and four data cards per sample within the batch (group of samples which use the same control cards). Running time, including a summary printout, is about one-half minute per sample for a twenty-four month analysis on the Control Data Corporation 3300[1]. The computer program has been coded in FORTRAN.

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[1] The commercial designation of the computer is given to provide precise information concerning the model developed. Use of the trade name does not constitute indorsement by BESRL or by the Army.

The Army noncareer system may be represented in the simplified flow model with links and nodes for possible flows and delays (shown in Figure 1). Delays at the nodes representing basic and MOS training and short tour are of the same duration for the two kinds of personnel considered in ACCMOD, but the stays in the various categories in the base tour depend on the duration of the individual's service commitment. The vectors and matrices shown in Figure 2 represent the states through which the inventory is distributed for simulation, with commitment and short tour duration represented by the dimensions of the vectors and matrices. Flows are limited to those possible within the separate AUS and RA subsystems, and men are kept in the subsystem for the duration of their commitment or for a lesser period, depending upon loss rates simulated. Since temporary nondeployability can be simulated by holding back a proportion of those with no previous short tour experience, a separate category need not be provided for those temporarily nondeployable.

No distinction is made between men who are permanently nondeployable at entry into the system and those who become permanently nondeployable as they near the end of their service, since men in the two groups appear to have the same effect on system performance. A slightly elaborated conceptualization of the simulated system is shown in Figure 3. Since one purpose of the simulation is to estimate the additional input needed, it is necessary to simulate availability of additional men when they are required. The computer program simulates input of additional men when sufficient replacements (or additions) for the short tour are not obtainable from existing deployable assets. This new input is assumed ready for immediate assignment, with training and leave already accomplished, factors which would have required induction or enlistment some months prior to the month for which the system is simulated. At the end of the twenty-four month projection, the required gross input into the MOS school is repositioned into the month during which the trainees would have entered the school.

Since ACCMOD represents an independent subsystem, MOS losses taken as percent of school input not graduating may not be losses to the Army as a whole. As represented here, the model makes no attempt to evaluate the overlap in losses and subsequent gains by other occupational subsystems or to examine mass substitution which might be made under the policy of mass fill. Both considerations are planned for an extension of the work started here or in connection with other models now under development in the SIMPO Task.

The sequence of simulation steps covered in the computerization of ACCMOD is shown in Figure 4, a flow chart of the program logic and decision points. About two thirds of the total program is devoted to processing and spreading the simplified data input into a form which can be updated month by month. Step 4 of the flow chart indicates that this processing is done; the remainder of the chart is devoted to the logic of the monthly updating iteration. It is believed that future use of the model will be based upon the MOS starting inventory supplied in a different format from that presently used. If this is the case, the modular structure of the program assures that the first part of the computer program can be changed to compensate for changes in the form of the data base while the remaining steps remain unchanged.

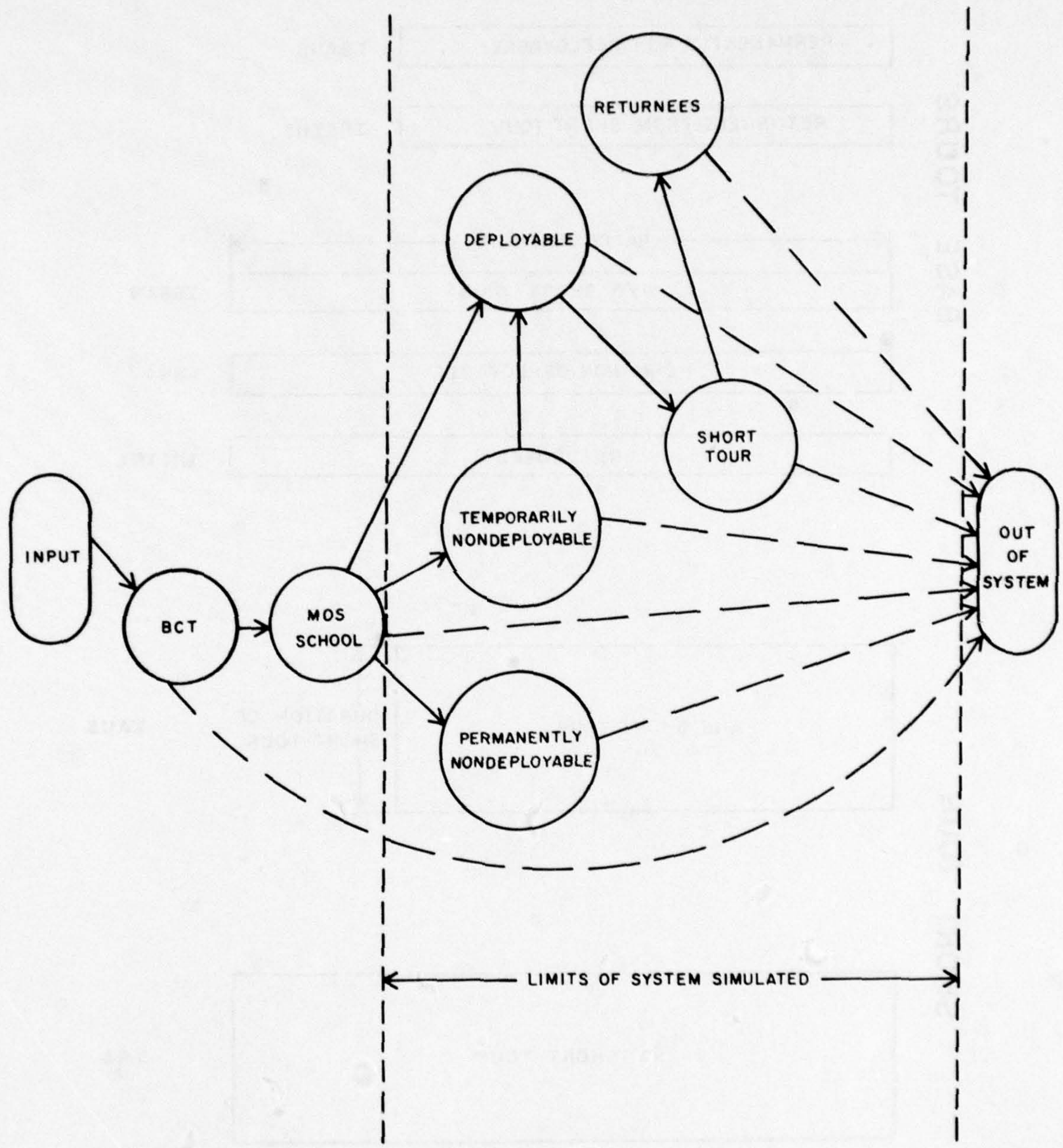

Figure 1. Simplified flow model of the Army noncareer subsystem

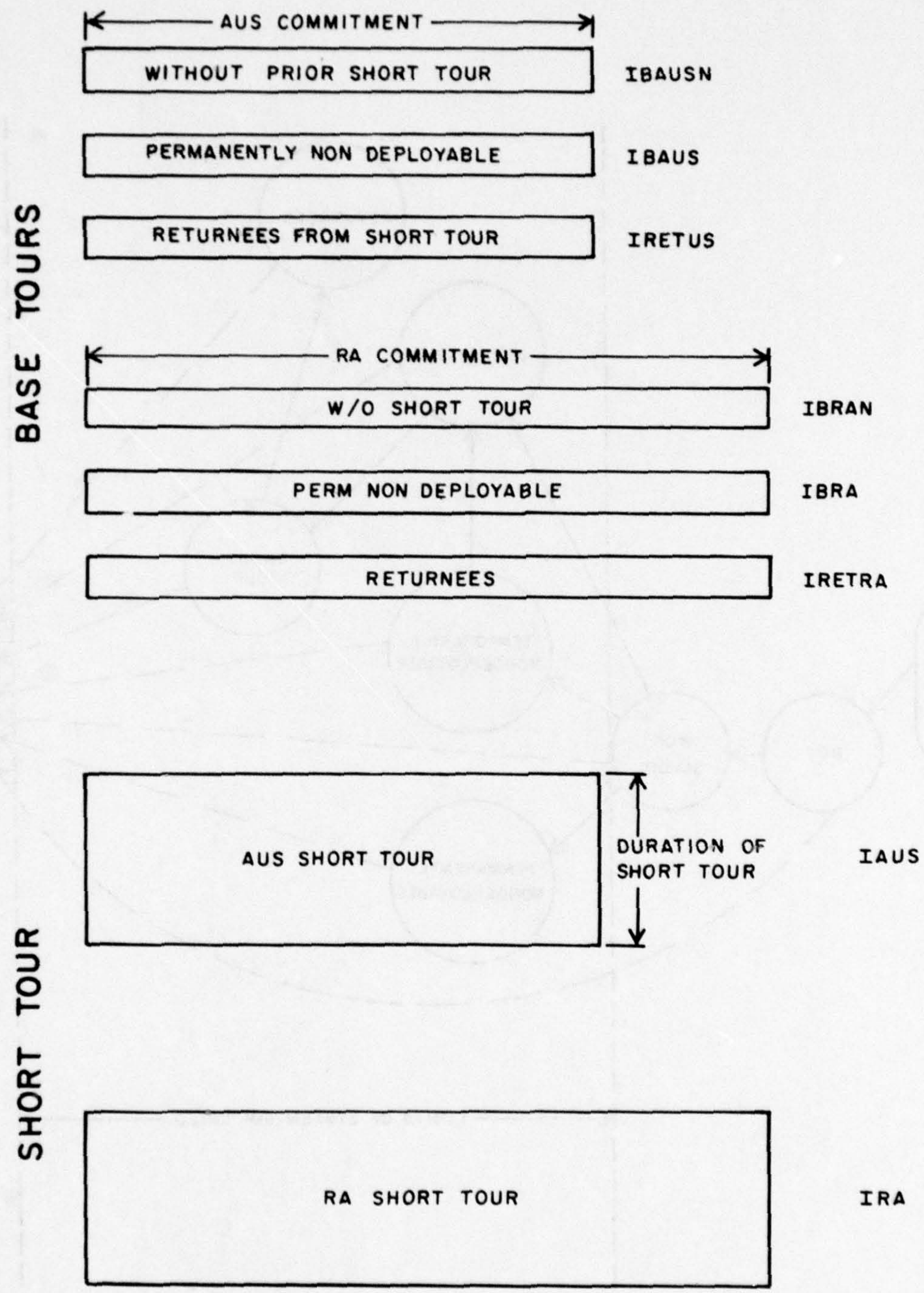

Figure 2. Tour matrices and vectors used in ACCMOD computer program

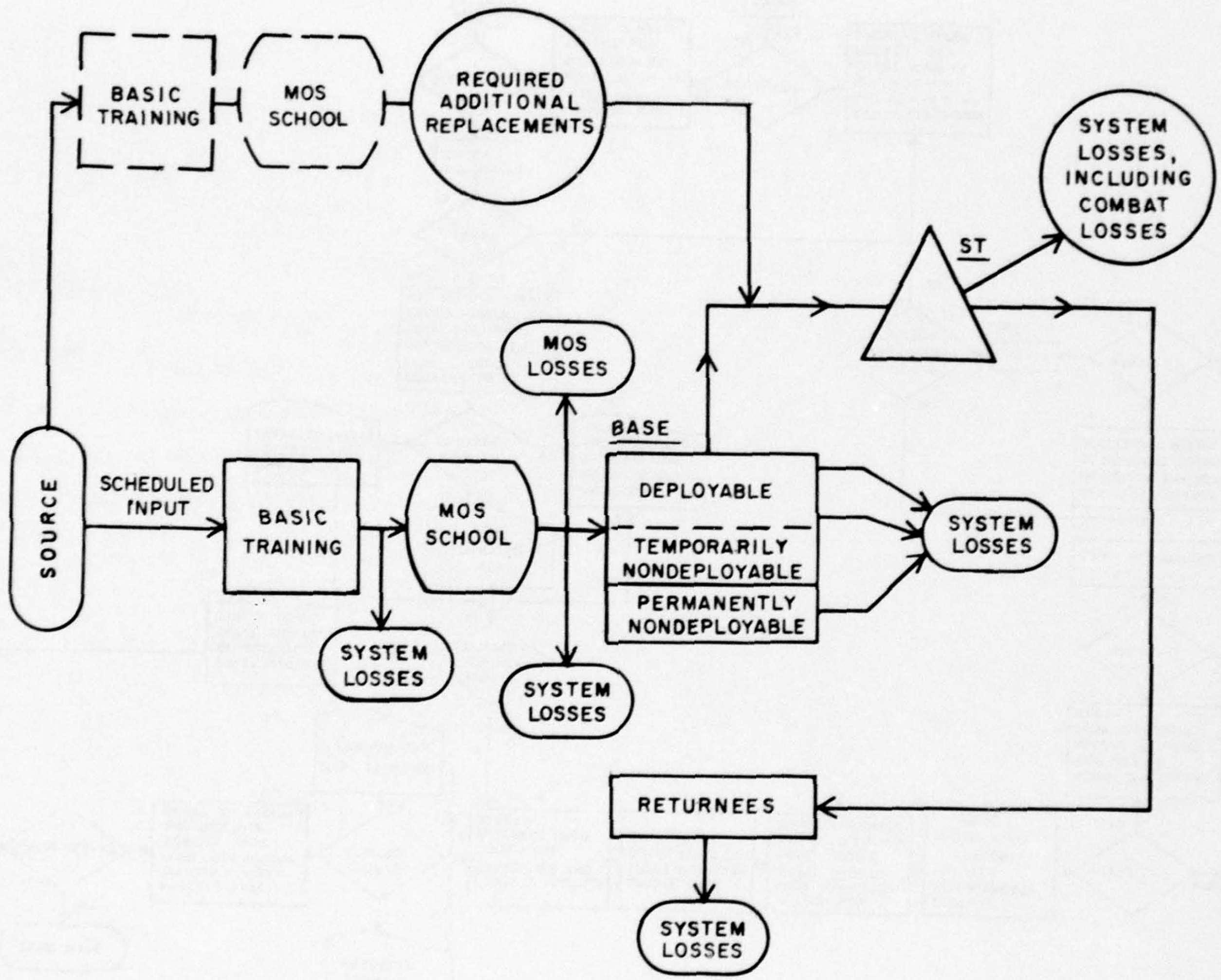

Figure 3. Model of the subsystem represented in ACCMOD

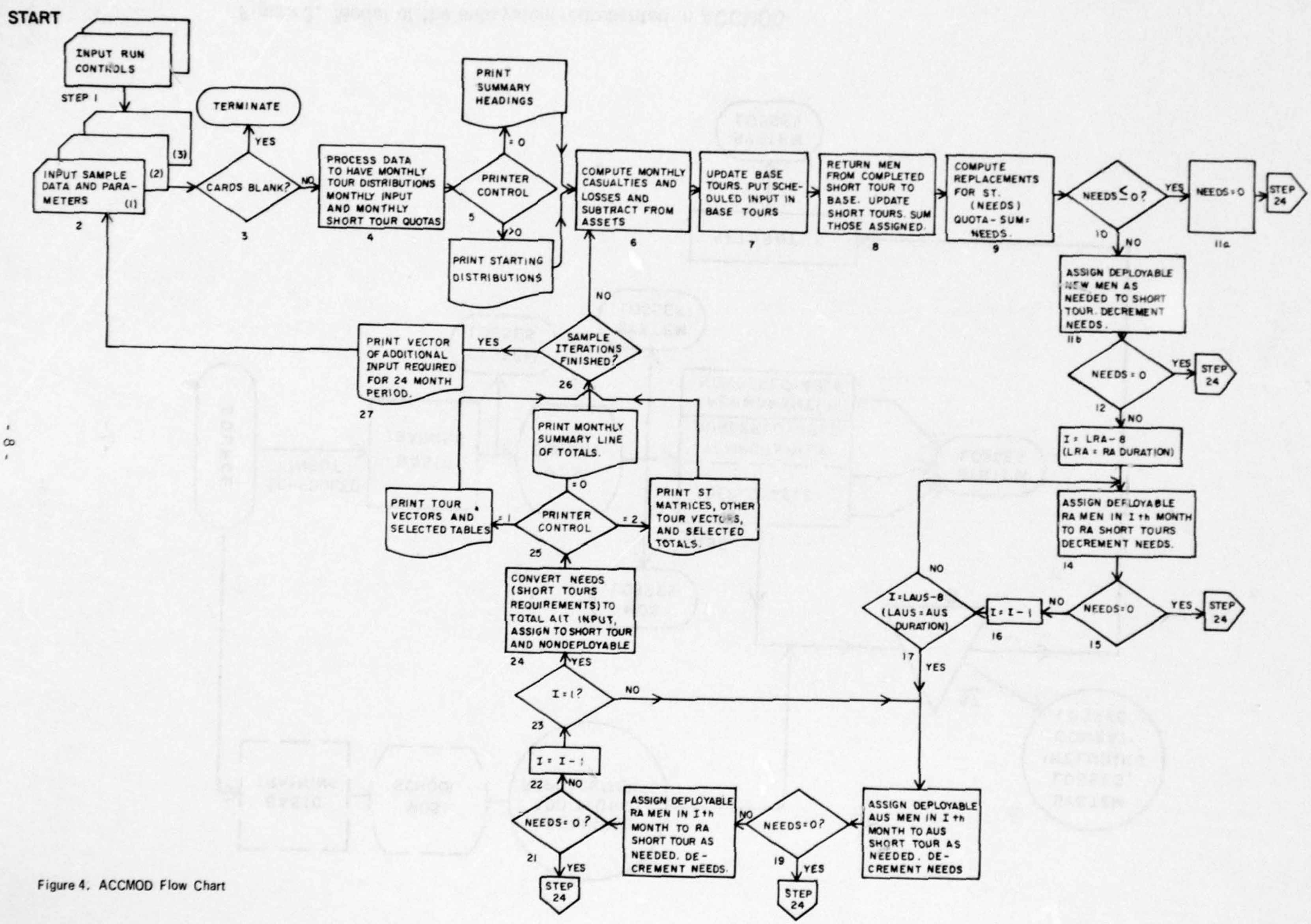

Figure 4. ACCMOD Flow Chart

THE COMPUTER PROGRAM

The computer program for ACCMOD has been broken into a sequence of operations and a brief description of each operation is supplied. An effort has been made to keep the explanations simple and meaningful at the expense of elegance of expression. The same operation numbers used here have been inserted in the computer program on comment cards. Additional explanation of the program sequence appears on other comment cards spread through the actual program.

Operation	Explanation
1. Read controls	1. Two cards. The first contains the format for reading the deployability factors for new input; the second, the estimated temporary nondeployability factor for people in the system longer than a month.
1.1 Read input data and sample parameters	1.1 Four* cards (all data fields 6 cols. each) Cd 1: SAMP = MOS identification PAUS = percent AUS in inventory PAUS1 = percent AUS in 1st year service PRA1 = percent RA in 1st year service PRA2 = percent RA in 2d year service NST = total number in short tour NRET(I), I=1,4: number of returnees with 0-6, 6-12, 13-18, 19-24 months in base tour NTOT = total inventory for MOS Cd 2: SAMP = MOS identification (not read) NQUOTN = Short tour requirements for past 6 months NQUOT(I), I = 1 to 4: short tour quota for four six-month intervals in future KAS = expected number of short tour casualties per month for first 6 months Cd 3: SAMP - MOS identification (not read) INPT(I), I=1,5: Scheduled system input for past 6 months and for four 6-month periods in the next 25 months LT = duration of AIT school RPNDPL = rate of permanent nondeployability RCCPL = rate of course completion JUMP1 = printer control: 0 = only summary sheet printed; 1 = monthly tour vectors printed; 2 = ST matrices and monthly vectors printed

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*Shown as three cards in Figure 4. Data fields were changed to allow for bigger numbers in some samples.

Operation	Explanation
	Cd 4: SAMP - not read RN = Historical rate of usage of new trainees RN1(a) = 1st estimate of future rates of usage of trainees RN1(b) = 2d estimate of future rate of usage of trainees
2. Use AUS rate, 1st year AUS rate, 1st and 2d year RA rates to break total inventory into subtotals	2. NAUST = PAUS * NTOT Total AUS is equal to percent AUS times total inventory NRAT = NTOT - NAUST Total RA is system total minus total AUS NAUS1 = PAUS1 * NAUST AUS 1st year men equals rate AUS times total AUS NAUS2 = NAUST - NAUS1 AUS 2d year men equals the remaining AUS men NRA1 = PRA1 * NRAT RA 1st year men equals rate RA 1st year times total RA NRA2 = PRA2 * NRAT RA 2d year men equals rate RA 2d year times total RA NRA3 = NRAT - NRA1 - NRA2 RA 3d year men obtained by subtracting 1st and 2d year men from total
3. Convert 6-month scheduled input into monthly blocks	3. INPT(I), I = 1,5: 6-month blocks of scheduled input (In the Dec 67 run INO(I), the number of new trainees reserved for NCO school under the new program was subtracted from INPT(I), since this simulation considers the need of the first four enlisted grades only.) New (J) = INPT(I)/6 (In the Dec 67 analysis, the input to AIT school was the source of INPUT. This was decremented for losses and AIT graduation rate then set forward into the month of graduation--historical information was included for one 6-month period.)

Operation	Explanation
3.1 Calculate monthly quotas from the 6-month quotas supplied	3.1 NST was accepted as the starting ST quota and a linear increase (or decrease) was made in monthly steps to the first 6-month quota. The linear step process was repeated between the remaining 6-month quotas.
4. Calculate permanently undeployable and spread in monthly block	4. RPNDPL* number in each year block from AUS and RA. First year men were spread in LL months where LL = 12 - LT - 2, since part of the 1st year of service is spent in basic and advanced individual training and these times were not included in the simulation.
5. Spread returnees in base tour	5. Assumption was made that all returnees had served out a full year in short tour and had had 30 days leave before assignment. Thus, returnees with 0-6 months went into 13-19 months in their service duration, with 7-12 into 20-25, and so on.
6. Put remainder of RA and AUS people in base tour in appropriate month of service	6. Sums of returnees and nondeployables subtracted from appropriate cells in AUS and RA yearly totals. Remainder spread in base tours, IBAUSN and IBRAN.
7. Compute ratio of NST to sum of CONUS spread in months 2 and higher	7. Sum IBRAN, 2 to LRA, and IBAUSN, 2 to LAUS. This sum was equal to JTOT. NST/JTOT = R Relation of short tour total to assignable total
8. Compute number in ST for each month in commitment	8. R*IBRAN and R*IBAUSN were used as the row sums of IRA and IAUS, the RA and AUS matrices for ST.
9. Spread row sums in months of time in ST	9. In the Dec 67 run, row sums for i = 2, 13 were put in positions 1 to 12 for time in ST for IAUS. 14 to LAUS went in blocks starting at 25 minus LAUS and ending at 12 (for the LAUS row).

	Operation		Explanation
			For IRA a similar plan was followed. Row sums 2, 13 went into tour IRA months 1 to 12; sums 14 to 25 into 1 to 12; sums 26 to IRA into (37-IRA) to 12.
10.	Put AUS and RA men without ST service but nearing the end of their commitment in nondeployable category	10.	In the Dec 67 analysis, men with 8 or less months left to serve were considered non-deployable. These were added to the men already in IBAUS and IBRA.
11.	Test printer control, JUMP1	11.	If JUMP1 > 0, print starting position. If JUMP1 = 0, print summary sheet headings.
12.	Start updating loop	12.	Assets were stepped through time in 1-month steps with casualties and losses taken at each iteration. NT = 1 to ITER1 or 24 + LT + 1 to provide for having input ready when needed.
13.	Calculate casualties for all cells in ST	13.	Number of casualties per month was read in as <u>KAS</u>. This was divided by the number in ST to obtain a rate which was then multiplied by each cell frequency in IAUS and IRA, results summed, and the rate corrected. The casualties were then recalculated and dropped from the system.
14.	Calculate losses for all tours	14.	.065/year was used as the loss rate or slightly over .5% per month. These losses were taken from each cell frequency and dropped from the system.
14.1	Compute sum of those ending commitment	14.1	Men in LAUS month for AUS and LRA month for RA ended service. This number was computed before updating any tours.
15.	Step cells forward in nondeployable tours	15.	By replacing each cell frequency with that of the one beneath it, the top frequency (IAUS or IRA) was dropped from the system.

	Operation		Explanation
16.	Move all men in 9th month before end of commitment to 8th month before end in nondeployable category	16.	Before working with IBRAN and IBAUSN tours, the cell frequency in I8 or J8 was added to that in I7 or J7 for IBRA or IBAUS.
17.	Update base tours without ST service	17.	IBRAN and IBAUSN cells were steeped forward. First positions were cleared.
18.	Assign new input to IBAUS, IBAUSN, IBRA and IBRAN	18.	RPNDPL*NEW(NT)*RAUS - IBAUS(1) (1-RPNDPL)*NEW(NT)*RAUS = IBAUSN(1) RPNDPL*NEW(NT)-IBAUS(1) = IBRA(1) NEW(NT)-IBAUS(1)-IBRA(1)-IBAUSN(1) = IBRAN(1)
18.1	Update returnee tours IRETUS and IRETRA	18.1	When the cells in these tours were stepped forward, the men completing their commitments were lost from the system.
19.	Return men who have completed short tour to returnee tours	19.	All in IAUS(I,12) for I = 1, LAUS-1 were returned to IRETUS; those in IRA(I,12) for I = 1, LRA-1 to IRETRA. Duration of service was updated at the same time. [To simulate the policy of early release, of men ending service up to 3 months early at the completion of ST, only those in I = 1 to LAUS-4 and I = 1 to LRA-4 should be saved. This was <u>not</u> done in Dec 67 simulations.]
20.	Update columns of IAUS and IRA; set 1st row equal to zero	20.	If J = I + 1, IAUS(L,J) = IAUS (L,I) for I = 1, r and L = 1 to LAUS; and IRA(M,J) = IRA(M,I) for I = 1, 12 and M = 1 to LRA. IAUS (I,1) = 0, for I = 1, LAUS and IRA(j,1) = 0 for J = 1, LRA.
21.	Update rows of IAUS and IRA; set 1st row equal to zero	21.	If J = I + 1, IAUS (J,L) = IAUS(I,L) for I = 1, LAUS-1 and L = 1, 12; and IRA(J,M) = IRA(I,M) for I = 1, LRA-1 and M = 1, 12. IAUS(1,I) = 0 and IRA(1,I) = 0 for I = 1, 12.
22.	Compute number in short tour	22.	$IST = \sum_{i=1}^{LAUS} \sum_{j=1}^{12} IAUS(I,J) + \sum_{i=1}^{LRA} \sum_{j=1}^{12} IRA(I,J)$

23. Compute additional number needed to fill ST quota	23. IQUOT(NT) - IST = NEEDS, the number needed. If this number is negative, NEEDS is set equal to zero.
24. Search for replacements using IBRAN(2), IBAUSN(2) first; then starting with IBRAN (IRA-8) and working down to IBRAN(IAUS-7); then alternating between IBRAN and IBAUSN from IAUS-8 down through month 3 NOTE: The order of search shown here was reversed for some simulations and men new to the system were used after older assets.	24. Two nondeployability factors are used here--very small for those in month 2 at first assignment after training (18% was used in the Dec 67 analysis) and higher for the remainder of the cells. Since other assignments will have been made when trainees are not sent to short tour directly after completion of training (plus leave), a second assignment is hindered by priority of 1st assignment received and by system inertia (due to lag in data processing, man may not be carried as available for assignment until 3 or 4 months after arrival at duty station).
24.1 At each cell of IBRAN or IBAUSN which was used to meet NEEDS, available people were transferred to the same month of service and the first month of ST in IRA or IAUS.	24.1 For example: IX = (I-RPNDPL)*X, where x is the number in the Jth month of IBAUSN. IF (NEEDS-Ix) a,a,b (a) IBAUS(J) = IBAUS(J)-NEEDS IAUS(J,1) = IAUS(J,1) + NEEDS NEEDS = 0 END SEARCH LOOP (GO TO 99) (b) IBAUS(J) = IBAUS(J)-Ix IAUS(J,1) = IAUS(J,1) + Ix NEEDS = NEEDS-Ix CONTINUE SEARCH LOOP
25. Additional input required for short tour is equal to NEEDS. Gross school input required takes attrition rate by school duration, graduation rate and nondeployability rate into account.	25. Residual NEEDS = additional repl for ST. NEEDS/[(1-RPNDPL)*.82*(1-.065/12*(LT+1))*RCCPL] = total additional input needed.
26. Print results according to JUMP1.	26. When JUMP1 = 2, print ST matrices. When JUMP1 = 1 or 2, print monthly tour vector and selected other information. When JUMP1 = 0, print summary line for month.

APPENDIX A

ACCMOD COMPUTER PROGRAM

APPENDIX A-1. LISTING OF ACCMOD COMPUTER PROGRAM

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      PROGRAM X69
C     MODD        OLSON
C THIS VERSION OF ACCMOD USES A SHORT TOUR DISTRIBUTION BASED ON THE
C OVERALL DISTRIBUTION OF ASSETS IN THE SYSTEM. REPLACEMENT SCHEDULES
C ARE KEPT AS EVEN AS POSSIBLE UNDER THIS ASSUMPTION.
C     PROGRAM ACCMOD         OLSON
C     DYNAMIC FLOW MODEL FOR USE IN PROJECTING NEEDS FOR ACCESSIONS TO THE NON-
C     CAREER SYSTEM.  MOS SUBSYSTEMS ARE EXAMINED SEPARATELY.
C     ORIGINAL PROGRAM CODED NOVEMBER 1967
      DIMENSION IRA(36,12), IAUS(24,12), IBRA(36) IBAUS(24), IBRAN(36)
      DIMENSION IBAUSN(36), NQUOT(6), NRET(4), INPT(6), IAUSMT(24), IRAMT(36)
      DIMENSION IRETUS(24), IREIRA(36), MRA(12), MAUS(12)
      DIMENSION NEW(36), NEEW(36), IRET(24), IQUOT(36), INO(5)
C OPERATION 1
      READ 500,(FMT(I),I=1,9)
  500 FORMAT(9A8)
      READ 501,RINDPL
  501 FORMAT(F5.3)
C OPERATION 1.1
  101 READ 1,SAMP,PAUS,PAUS1,PRA1,PRA2,NST,(NRET(I),I=1,4),NTOT,
     1(NQUOT(J),J=1,4),KAS,(INPT(K),K=1,5),LT,RPNDPL,RLNDPL,RCCPL,JUMP1,
     2(INO(L),L=2,5)
    1 FORMAT(A5,4F5.3,11I5/5X6I5,3F5.3,5I5)
       IF   (NTOT)102,999,102
  102 CONTINUE
      READ FMT,RN,RN1
C OPERATION 2
C CALCULATE NUMBER IN AUS IN EACH TIME PERIOD
      NAUST=PAUS*NTOT
      NRAT=NTOT-NAUST
      NAUS1=PAUS1*NAUST
      NAUS2=NAUST-NAUS1
      LL=10-LT
      LAUS=22-LT
      LRA=34-LT
      ITER=24+LT
      XT=LT
      DO 201 I=1,LAUS
      DO 201 J=1,12
  201 IAUS(I,J)=0
      DO 202 I=1,LRA
      DO 202 J=1,12
  202 IRA(I,J)=0
      DO 131 I=1,36
  131 IBRA(I)=IBRAN(I)=IBAUSN(I)=IRAMT(I)=NEEW(I)=IQUOT(I)=NEW(I)=0
      DO 132 I=1,24
  132 IBAUS(I)=IAUSMT(I)=IRETUS(I)=IRET(I)=0
      DO 133 I=1,30
  133 NEW(I)=0
C OPERATION 3
C CONVERTS SIX MONTH SCHEDULED INPUT TO MONTHLY BASIS
      INO(1)=0
      DO 53 I=1,5
      Y=INPT(I)-INO(I)
      XN=Y/6.
      X=0
      N=0
      ITEM=0
      J=6*I
```


PRECEDING PAGE BLANK

```
      K=J-5.
      DO 54 II=K,J
      X=X+XN-N
      NEW(II)=X
      N=NEW(II)
   54 ITEM=ITEM+NEW(II)
      XTEM=ITEM
      IK=Y-XTEM+.5
   53 NEW(J)=NEW(J)+IK
      DO 123 I=1,ITER
      J=I+6-LT
  123 NEW(I)=NEW(J)
      DO 124 I=1,ITER
      X=NEW(I)
      X=X*(1.-XT*.065/12.)
      X=X*RCCPL+.5
  124 NEW(I)=X
      ITER1=ITER+1
      ITER6=ITER+6
      DO 505 I=ITER1,ITER6
  505 NEW(I)=NEW(ITER)
C OPERATION 3.1
C CALCULATE MONTHLY QUOTAS (LAST 12 ARE SET EQUAL TO THE 24TH).
      X=NQUOT(1)
      XST=NST
      XN=(X-XST)/6.
      IQUOT(1)=XN+.5+XST
      DO 120 I=2,5
      J=I-1
      X=IQUOT(J)
  120 IQUOT(I)=X+XN+.5
      DO 121 I=1,4
      J=6*I
  121 IQUOT(J)=NQUOT(I)
      DO 122 I=2,4
      I1=I-1
      J=6*I-1
      K=6*I-5
      X=NQUOT(I)
      Y=NQUOT(I1)
      XN=(X-Y)/6.
      DO 122 IM=K,J
      JN=IM-1
      X=IQUOT(JN)
  122 IQUOT(IM)=X+XN
      DO 502 I=25,36
  502 IQUOT(I)=IQUOT(24)
C OPERATION 4
C CALCULATE PERMANENT NONDEPLOYABLES AND SPREAD IN BASE
      XNAUS1=RPNDPL*NAUS1
      XNAUS2=RPNDPL*NAUS2
      XN=XNAUS1/LL
      X=0
      N=0
      ITEM=0
      L1=LL-1
      DO 2 I=1,L1
      X=X+XN-N
      IBAUS(I)=X
      N=IBAUS(I)
    2 ITEM=ITEM+IBAUS(I)
      XTEM=ITEM
```

```
      IBAUS(LL)=XNAUS1-XTEM+.5
      LL1=LL+1
      LS1=LAUS-1
      XN=XNAUS2/12
      X=0
      N=0
      ITEM=0
      DO 3 I=LL1,LS1
      X=X+XN-N
      IBAUS(I)=X
      N=IBAUS(I)
    3 ITEM=ITEM+IBAUS(I)
      XTEM=ITEM
      IBAUS(LAUS)=XNAUS2-XTEM+.5
C CALCULATE NUMBER IN RA FOR EACH TIME PERIOD
      NRA1=PRA1*NRAT
      NRA2=PRA2*NRAT
      NRA3=NRAT-NRA1-NRA2
      X=NRA1
      Y=NAUS1
      IF(X+Y)143,143,190
  143 RAUS=PAUS
      GO TO 191
  190 RAUS=Y/(X+Y)
  191 CONTINUE
C CALCULATE NONDEPLOYABLES IN RA AND SPREAD IN BASE
      XNRA1=RPNDPL*NRA1
      XNRA2=RPNDPL*NRA2
      XNRA3=RPNDPL*NRA3
      XN=XNRA1/LL
      X=0
      N=0
      ITEM=0
      DO 4 I=1,L1
      X=X+XN-N
      IBRA(I)=X
      N=IBRA(I)
    4 ITEM=ITEM+IBRA(I)
      XTEM=ITEM
      IBRA(LL)=XNRA1-XTEM+.5
      XN=XNRA2/12
      X=0
      N=0
      ITEM=0
      LR1=LAUS-1
      DO 5 I=LL1,LR1
      X=X+XN-N
      IBRA(I)=X
      N=IBRA(I)
    5 ITEM=ITEM+IBRA(I)
      XTEM=ITEM
      IBRA(LAUS)=XNRA2-XTEM+.5
      XN=XNRA3/12.
      X=0
      N=0
      ITEM=0
      LS1=LAUS+1
      LR1=LRA-1
      DO 130 I=LS1,LR1
      X=X+XN-N
      IBRA(I)=X
      N=IBRA(I)
```

```
130 ITEM=ITEM+IBRA(I)
    XTEM=ITEM
    IBRA(LRA)=XNRA3-XTEM+.5
C OPERATION 5
C SPREAD RETURNEES IN AUS AND RA TOURS
    DO 6 I=1,4
    Y=NRET(I)
    XN=Y/6.
    ITEM=0
    J=I*6
    K=J-5
    X=0
    N=0
    DO 7 II=K,J
    X=X+XN-N
    IRET(II)=X
    N=IRET(II)
  7 ITEM=ITEM+IRET(II)
    XTEM=ITEM
    XRET=IRET(J)
  6 IRET(J)=XRET+Y-XTEM+.5
    DO 8 I=14,LAUS
    K=I-13
    IRETUS(I)=RAUS*IRET(K)
  8 IRETRA(I)=IRET(K)-IRETUS(I)
    DO 9 I=1,13
  9 IRETUS(I)=IRETRA(I)=0
    J=LAUS+1
    DO 10 I=J,36
    K=I-13
 10 IRETRA(I)=IRET(K)
    J=37-LT
    IX=0
    DO 11 I=J,36
    IX=IX+IRETRA(I)
 11 IRETRA(I)=0
    IRETRA(LRA)=IX+IRET(24)
    JTEM=ITEM=0
    DO 12 I=1,LL
    JTEM=JTEM+IBAUS(I)+IRETUS(I)
 12 ITEM=ITEM+IBRA(I)+IRETRA(I)
    IDAUS1=NAUS1-JTEM
    IDRA1=NRA1-ITEM
    JTEM=ITEM=0
    DO 13 I=LL1,LAUS
    JTEM=JTEM+IBAUS(I)+IRETUS(I)
 13 ITEM=ITEM+IBRA(I)+IRETRA(I)
    IDAUS2=NAUS2-JTEM
    IDRA2=NRA2-ITEM
    LAUS1=LAUS+1
    ITEM=0
    DO 14 I=LAUS1,LRA
 14 ITEM=ITEM+IBRA(I)+IRETRA(I)
C OPERATION 6
C COMPUTE REMAINING ASSETS.
    IDRA3=NRA3-ITEM
C ASSIGN AUS SCHOOL OUTPUT TO LEAVE CATEGORY.
    IBAUSN(1)=RAUS*NEW(1)
C DISTRIBUTE REMAINDER IN MONTHLY CELLS.
    X1=IDAUS1-IBAUSN(1)
    X=0
    N=0
```

```
      ITEM=0
      XN=X1/L1
      DO 15 I=2,L1
      X=XN+X-N
      IBAUSN(I)=X
      N=IBAUSN(I)
   15 ITEM=ITEM+IBAUSN(I)
      XTEM=ITEM
      IBAUSN(LL)=X1-XTEM+.5
      X1=IDAUS2
      X=0
      N=0
      ITEM=0
      XN=X1/12
      DO 16 I=LL1,LAUS
      X=XN+X-N
      IBAUSN(I)=X
      N=IBAUSN(I)
   16 ITEM=ITEM+IBAUSN(I)
      XTEM=ITEM
      IK=X1-XTEM+.5
      IBAUSN(LAUS)=IBAUSN(LAUS)+IK
C ASSIGN  RA SCHOOL OUTPUT TO LEAVE CATEGORY.
      IBRAN(1)=NEW(1)-IBAUSN(1)
      X1=IDRA1-IBRAN(1)
      X=0
      N=0
      ITEM=0
      XN=X1/L1
      DO 18 I=2,L1
      X=XN+X-N
      IBRAN(I)=X
      N=IBRAN(I)
   18 ITEM=ITEM+IBRAN(I)
      XTEM=ITEM
      IBRAN(LL)=X1-XTEM+.5
      X1=IDRA2
      X=0
      N=0
      ITEM=0
      XN=X1/12
      DO 19 I=LL1,LAUS
      X=X+XN-N
      IBRAN(I)=X
      N=IBRAN(I)
   19 ITEM=ITEM+IBRAN(I)
      XTEM=ITEM
      IK=X1-XTEM+.5
      IBRAN(LAUS)=IBRAN(LAUS)+IK
      X1=IDRA3
      X=0
      N=0
      ITEM=0
      LAUS1=LAUS+1
      XN=X1/12
      DO 20 I=LAUS1,LRA
      X=X+XN-N
      IBRAN(I)=X
      N=IBRAN(I)
   20 ITEM=ITEM+IBRAN(I)
      XTEM=ITEM
      IK=X1-XTEM+.5
```

```
      IBRAN(LRA)=IBRAN(LRA)+IK
      ITEM=0
C OPERATION 7
C COMPUTE ASSETS IN POSSIBLR SI MONTHS.
      DO 22 I=2,LAUS
   22 ITEM=ITEM+IBAUSN(I)
      JTEM=0
      DO 23 I=2,LRA
   23 JTEM=JTEM+IBRAN(I)
      JTOT=ITEM+JTEM
C COMPUTE ASSIGNMENT RATIO.
      X=NST
      Y=JTOT
      IF(JTOT)140,140,141
  141 CONTINUE
      R=X/Y
C OPERATION 8
C PUT AUS AND RA MEN IN SI ROW TOTALS. (IAUSMT AND IRAMT)
      DO 24 I=2,LAUS
   24 IAUSMT(I)=(R*IBAUSN(I)+.5)
      DO 25 I=2,LRA
   25 IRAMT(I)=(R*IBRAN(I)+.5)
      IRAMT(1)=0
      IAUSMT(1)=0
      DO 147 I=1,LAUS
      IBAUSN(I)=IBAUSN(I)-IAUSMT(I)
      IF(IBAUSN(I))148,147,147
  148 IBAUSN(I)=0
  147 CONTINUE
      DO 189 I=1,LRA
      IBRAN(I)=IBRAN(I)-IRAMT(I)
      IF(IBRAN(I))149,189,189
  149 IBRAN(I)=0
  189 CONTINUE
      I1=LAUS-1
      II1=LAUS+1
      I6=LAUS-6
      I7=LAUS-7
      I8=LAUS-8
      I9=LAUS-9
      J1=LRA-1
      JJ1=LRA+1
      J6 =LRA-6
      J7=LRA-7
      J8=LRA-8
      J9=LRA-9
C OPERATION 9
C SPREADS MONTHLY TOTALS THROUGH IAUS MATRIX
      DO 230 I=1,12
      J=I+1
      IAUS(J,I)=IAUSMT(J)
  230 IRA(J,I)=IRAMT(J)
      K=25-LAUS
      DO 231 I=14,LAUS
      K=K+1
  231 IAUS(I,K)=IAUSMT(I)
      DO 232 I=14,25
      K=I-13
  232 IRA(I,K)=IRAMT(I)
      K=37-LRA
      DO 233 I=26,LRA
      K=K+1
```

```
233 IRA(I,K)=IRAMT(I)
    DO 38 I=1,12
 38 MRA(I)=MAUS(I)=0
    DO 39 I=1,12
    DO 39 J=1,LAUS
 39 MAUS(I)=MAUS(I)+IAUS(J,I)
    DO 52 I=1,12
    DO 52 J=1,LRA
 52 MRA(I)=MRA(I)+IRA(J,I)
C OPERATION 10
C PUT AUS AND RA MEN NEARING THEIR END OF SERVICE IN NONDEPLOYABLE CATEGORY)
    J=LAUS-7
    DO 17 I=J,LAUS
    IBAUS(I)=IBAUS(I)+IBAUSN(I)
 17 IBAUSN(I)=0
    J=LRA-7
    DO 21 I=J,LRA
    IBRA(I)=IBRA(I)+IBRAN(I)
 21 IBRAN(I)=0
    JST=NST
C OPERATION 11
C TEST PRINTER CONTROL--JUMP1--IF GT 0 PRINT STARTING DISTRIBUTION.
    IF(JUMP1)139,139,138
138 PRINT 314,SAMP
314 FORMAT(8H1  MOS    A5,20H STARTING POSITION          )
    PRINT 302
    PRINT 303,((IAUS(I,J),J=1,12),I=1,LAUS)
    PRINT 303,(MAUS(I),I=1,12)
    PRINT 304
    PRINT 303,((IRA(I,J),J=1,12),I=1,LRA)
    PRINT 303,(MRA(I),I=1,12)
    PRINT 305
    PRINT 303,(IRETUS(I),I=1,LAUS)
    PRINT 306
    PRINT 303,(IRETRA(I),I=1,LRA)
    PRINT 307
    PRINT 303,(IBAUSN(I),I=1,LAUS)
    PRINT 308
    PRINT 303,(IBRAN(I),I=1,LRA)
    PRINT 309
    PRINT 303,(IBAUS(I),I=1,LAUS)
    PRINT 310
    PRINT 303,(IBRA(I),I=1,LRA)
    PRINT 315
315 FORMAT(25H0SCHEDULED MONTHLY INPUT       )
    PRINT 303,(NEW(I),I=1,24)
    PRINT 316
316 FORMAT(32H0MONTHLY QUOTAS FOR SHORT TOUR       )
    PRINT 303,(IQUOT(I),I=1,24)
C IF PRINTER CONTROL =0 PRINT SUMMARY SHEET HEADINGS.
139 CONTINUE
    IF(JUMP1)319,318,319
318 PRINT 311,SAMP
311 FORMAT(10H1    MOS          A5)
    PRINT 312
312 FORMAT(130H0                                   OTH        END       SCHD
   1 PERM                     IN         W/O        SYST           ST          AIT
   2     MODEL      )
    PRINT 323
323 FORMAT(130H         MONTH          CAS         ATTN        TERM       INPT
   1 NDPL         RET          ST           ST          TOT        INPT         INPT
   2        INPT        )
```

```
  319 CONTINUE
C OPERATION 12
C BEGIN UPDATING LOOP.ITER1=24+LT+1,TWO YEARS PLUS AIT SCHOOL AND LEAVE.
      DO 100 NT=1,ITER1
C OPERATION 13
C CASUALTIES TAKEN FROM SHORT TOUR
      XST=NST
      X=KAS
      RKAS=X/XST
      NKAS=0
      DO 234 I=1,LAUS
      DO 234 J=1,12
      X=IAUS(I,J)
      IX=(X*RKAS+.5)
  234 NKAS=NKAS+IX
      DO 235 I=1,LRA
      DO 235 J=1,12
      X=IRA(I,J)
      IX=(X*RKAS+.5)
  235 NKAS=NKAS+IX
      X=KAS
      Y=NKAS
      RKAS=RKAS*X/Y
      NKAS=0
C AFTER FIRST 6 ITERATIONS THE CASUALTY RATE AND THE RATE OF USAGE FOR NEW PE
C NNEL ARE BEING CHANGED
      IF(NT-7)135,136,135
  136 RKAS=1.1*RKAS
      RN=RN1
  135 CONTINUE
      DO 203 I=1,LAUS
      DO 203 J=1,12
      X=IAUS(I,J)
      IX=(X*RKAS+.5)
      IAUS(I,J)=IAUS(I,J)-IX
  203 NKAS=NKAS+IX
      DO 204 I=1,LRA
      DO 204 J=1,12
      X=IRA(I,J)
      IX=(X*RKAS+.5)
      IRA(I,J)=IRA(I,J)-IX
  204 NKAS=NKAS+IX
C OPERATION 14
C LOSSES TAKEN FROM ALL TOURS
      NL=0
      RL=.065/12.
      DO 206 I=1,LAUS
      X=IBAUS(I)
      IX=(X*RL+.5)
      IBAUS(I)=IBAUS(I)-IX
      NL=NL+IX
      X=IBAUSN(I)
      IX=(X*RL+.5)
      IBAUSN(I)=IBAUSN(I)-IX
      NL=NL+IX
      X=IRETUS(I)
      IX=(X*RL+.5)
      IRETUS(I)=IRETUS(I)-IX
      NL=NL+IX
      DO 206 J=1,12
      X=IAUS(I,J)
      IX=(X*RL+.5)
```

```
      IAUS(I,J)=IAUS(I,J)-IX
  206 NL=NL+IX
      DO 207 I=1,LRA
      X=IBRA(I)
      IX=(X*RL+.5)
      IBRA(I)=IBRA(I)-IX
      NL=NL+IX
      X=IBRAN(I)
      IX=(X*RL+.5)
      IBRAN(I)=IBRAN(I)-IX
      NL=NL+IX
      X=IRETRA(I)
      IX=(X*RL+.5)
      IRETRA(I)=IRETRA(I)-IX
      NL=NL+IX
      DO 207 J=1,12
      X=IRA(I,J)
      IX=(X*RL+.5)
      IRA(I,J)=IRA(I,J)-IX
  207 NL=NL+IX
C OPERATION 14.1
      IOUT=IBAUS(LAUS)+IRETUS(LAUS)+IBRA(LRA)+IRETRA(LRA)
      DO 506 I=1,12
  506 IOUT=IOUT+IRA(LRA,I)+IAUS(LAUS,I)
C OPERATION 15
C UPDATING BASE TOURS
      I1=LAUS-1
      II1=LAUS+1
      I6=LAUS-6
      I7=LAUS-7
      I8=LAUS-8
      I9=LAUS-9
      I10=LAUS-10
      J1=LRA-1
      JJ1=LRA+1
      J6 =LRA-6
      J7=LRA-7
      J8=LRA-8
      J9=LRA-9
      DO 55 I=1,I1
      J=II1-I
      K=J-1
   55 IBAUS(J)=IBAUS(K)
C OPERATION 16
C SHIFT MEN 8 MONTHS FROM RELEASE TO NONDEPLOYABLE.
      IBAUS(I7)=IBAUS(I7)+IBAUSN(I8)
      IBAUSN(I8)=0
C OPERATION 17
      DO 56 I=1,J1
      J=JJ1-I
      K=J-1
   56 IBRA(J)=IBRA(K)
      IBRA(J7)=IBRA(J7)+IBRAN(J8)
      IBRAN(J8)=0
      IBRA(1)=IBAUS(1)=0
      DO 57 I=1,19
      J=I7-I
      K=J-1
   57 IBAUSN(J)=IBAUSN(K)
      DO 58 I=1,J9
      J=J7-I
      K=J-1
```

```
   58 IBRAN(J)=IBRAN(K)
C OPERATION 18
      IBRAN(1)=IBAUSN(1)=0
      IBAUS(1)=RPNDPL*NEW(NT)*RAUS+.5
      X=IBAUS(1)
      IBRA(1)=RPNDPL*NEW(NT)-X+.5
      IBAUSN(1)=NEW(NT)*RAUS-X+.5
      IBRAN(1)=NEW(NT)-IBAUS(1)-IBRA(1)-IBAUSN(1)
C OPERATION 18.1
      DO 59 I=1,I1
      J=II1-I
      K=J-1
   59 IRETUS(J)=IRETUS(K)
      IRETUS(1)=0
      DO 60 I=1,J1
      J=JJ1-I
      K=J-1
   60 IRETRA(J)=IRETRA(K)
      IRETRA(1)=0
C OPERATION 19
C RETURN AUS FROM COMPLETED ST
      DO 61 I=1,I1
      J=I+1
   61 IRETUS(J)=IRETUS(J)+IAUS(I,12)
C RETURN RA FROM COMPLETED ST
      DO 62 I=1,J1
      J=I+1
   62 IRETRA(J)=IRETRA(J)+IRA(I,12)
C OPERATION 20
C UPDATE COLUMNS OF IAUS.
      DO 63 I=1,11
      J=13-I
      K=J-1
      DO 64 L=1,LAUS
   64 IAUS(L,J)= IAUS(L,K)
C UPDATE COLUMNS OF IRA
      DO 65 L=1,LRA
   65 IRA(L,J)=IRA(L,K)
   63 CONTINUE
      DO 66 I=1,I1
      J=II1-I
      K=J-1
C OPERATION 21
C UPDATE ROWS OF IAUS.
      DO 66 L=1,12
   66 IAUS(J,L)=IAUS(K,L)
C UPDATE ROWS OF IRA.
      DO 67 I=1,J1
      J=JJ1-I
      K=J-1
      DO 67 L=1,12
   67 IRA(J,L)=IRA(K,L)
C CLEAR 1ST COLUMN AND 1ST ROW OF IAUS AND IRA.
      DO 68 I=1,12
   68 IRA(1,I)=IAUS(1,I)=0
      DO 69 I=1,LAUS
   69 IAUS(I,1)=0
      DO 70 I=1,LRA
   70 IRA(I,1)=0
C OPERATION 22
C COMPUTE NUMBER IN SHORT TOUR.
      IST=0
```

```
      DO 71 I=1,LAUS
      DO 71 J=1,12
   71 IST=IST+IAUS(I,J)
      DO 72 I=1,LRA
      DO 72 J=1,12
   72 IST=IST+IRA(I,J)
C OPERATION 23
C COMPUTE REPLACEMENTS NEEDED.
      NEEDS=IQUOT(NT)-IST
      IF(NEEDS)73,73,74
   73 NEEDS=0
      GO TO 99
   74 CONTINUE
      R=1.-RTNOPL
C OPERATION 24
C NEW TRAINEES USED FOR SHORT TOUR REPLACEMENTS
      IX=RN*IBAUSN(2)
      IF(IX-NEEDS)160,161,161
  161 IBAUSN(2)=IBAUSN(2)-NEEDS
      IAUS(2,1)=IAUS(2,1)+NEEDS
      NEEDS=0
      GO TO 99
  160 NEEDS=NEEDS-IX
      IAUS(2,1)=IAUS(2,1)+IX
      IBAUSN(2)=IBAUSN(2)-IX
      IX=RN*IBRAN(2)
      IF(IX-NEEDS)162,163,163
  163 IBRAN(2)=IBRAN(2)-NEEDS
      IRA(2,1)=IRA(2,1)+NEEDS
      NEEDS=0
      GO TO 99
  162 NEEDS=NEEDS-IX
      IRA(2,1)=IRA(2,1)+IX
      IBRAN(2)=IBRAN(2)-IX
C OTHER ASSETS (THAN NEW TRAINEES) USED AS REPLACEMENTS FOR SHORT TOUR
      DO 75 I=1,12
      J=J7-I
      X=IBRAN(J)*R
      IX=X
      IF(IX-NEEDS)76,77,77
   77 IBRAN(J)=IBRAN(J)-NEEDS
      IRA(J,1)=IRA(J,1)+NEEDS
      NEEDS=0
      GO TO 99
   76 NEEDS =NEEDS-IX
      IRA(J,1)=IRA(J,1)+IX
   75 IBRAN(J)=IBRAN(J)-IX
      DO 78 I=1,I10
      J=I7-I
      X=IBAUSN(J)*R
      IX=X
      IF(IX-NEEDS)79,80,80
   80 IBAUSN(J)=IBAUSN(J)-NEEDS
      IAUS(J,1)=IAUS(J,1)+NEEDS
      NEEDS=0
      GO TO 99
   79 NEEDS=NEEDS-IX
      IBAUSN(J)=IBAUSN(J)-IX
      IAUS(J,1)=IAUS(J,1)+IX
      X=IBRAN(J)*R
      IX=X
      IF (IX-NEEDS)81,82,82
```

```
   82 IBRAN(J)=IBRAN(J)-NEEDS
      IRA(J,1)=IRA(J,1)+NEEDS
      NEEDS=0
      GO TO 99
   81 NEEDS=NEEDS-IX
      IBRAN(J)=IBRAN(J)-IX
   78 IRA(J,1)=IRA(J,1)+IX
C OPERATION 25
   99 X=NEEDS
      NEDE=NEEDS
      ISUM=IBAUS(2)+IBRA(2)
      JSUM=IAUS(2,1)+IRA(2,1)
      Y = X / .82
      YT=LT+1
      Z=Y/((1.-RPNDPL)*(1.-.065/12.*YT)*RCCPL)
      NEEW(NT)=Z+.5
      NNEW=RCCPL*NEEW(NT)*(1.-.065/12.*YT)+.5
      NDL=NNEW-NEEDS
      Y1=RAUS*NDL+.5
      IBAUS(2)=IBAUS(2)+Y1
      IBRA(2)=IBRA(2)+NDL-Y1
      IY=X*RAUS+.5
      IAUS(2,1)=IAUS(2,1)+IY
      IRA(2,1)=IRA(2,1)+NEEDS-IY
      XX=NNEW-IBAUS(2)-IBRA(2)-IAUS(2,1)-IRA(2,1)+ISUM+JSUM
      IX=XX
      LNEW=RAUS*XX+.5
      IBAUSN(2)=IBAUSN(2)+LNEW
      IBRAN(2)=IX-LNEW+IBRAN(2)
      DO 83 I=1,12
      MRA(I)=MAUS(I)=0
      DO 84 J=1,LAUS
   84 MAUS(I)=MAUS(I)+IAUS(J,I)
      DO 83 J=1,LRA
   83 MRA(I)=MRA(I)+IRA(J,I)
      JST=0
      DO 85 I=1,12
   85 JST=JST+MRA(I)+MAUS(I)
      JRET=0
      DO 86 I=1,LAUS
   86 JRET=JRET+IRETUS(I)
      DO 87 I=1,LRA
   87 JRET=JRET+IRETRA(I)
      IPNDPL=0
      DO 88 I=1,LAUS
   88 IPNDPL=IPNDPL+IBAUS(I)
      DO 89 I=1,LRA
   89 IPNDPL=IPNDPL+IBRA(I)
      NOTH=0
      DO 90 I=1,I8
   90 NOTH=NOTH+IBAUSN(I)
      DO 91 I=1,J8
   91 NOTH=NOTH+IBRAN(I)
      JTOT=JST+JRET+IPNDPL+NOTH
      DO 92 I=1,LAUS
      IAUSMT(I)=0
      DO 92 J=1,12
   92 IAUSMT(I)=IAUSMT(I)+IAUS(I,J)
      DO 93 I=1,LRA
      IRAMT(I)=0
      DO 93 J=1,12
   93 IRAMT(I)=IRAMT(I)+IRA(I,J)
```

```
C OPERATION 26
C IF PRINTER CONTROL=2,PRINT TOUR-EXPERIENCE DISTRIBUTION.
      IF(JUMP1-2)192,193,192
  193 PRINT 311,SAMP
      PRINT 301,NT
      PRINT 320,NKAS
  320 FORMAT(14H0CASUALTIES=     I5)
      PRINT 321,NL
  321 FORMAT(19H0OTHER ATTRITION=      I5)
      PRINT 322,IOUT
  322 FORMAT(30H0NUMBER ENDING COMMITMENT=       I5)
      PRINT 302
      PRINT 303,((IAUS(I,J),J=1,12),I=1,LAUS)
      PRINT 304
      PRINT 303,((IRA(I,J),J=1,12),I=1,LRA)
C IF PRINTER CONTROL=1 PRINT MONTHLY TOURS.
  192 IF(JUMP1)137,137,300
  300 PRINT 311, SAMP
      PRINT 301,NT
  301 FORMAT(7H0MONTH    I5)
      PRINT 302
  302 FORMAT(16H0AUS SHORT TOUR      )
      PRINT 303,(MAUS(I),I=1,12)
  303 FORMAT(1H 12I8)
      PRINT 304
  304 FORMAT(16H0RA SHORT TOUR       )
      PRINT 303,(MRA(I),I=1,12)
      PRINT 305
  305 FORMAT(16H0AUS RETURNEES     )
      PRINT 303,(IRETUS(I),I=1,LAUS)
      PRINT 306
  306 FORMAT(16H0RA RETURNEES       )
      PRINT 303,(IRETRA(I),I=1,LRA)
      PRINT 307
  307 FORMAT(40H0AUS PEOPLE WITH NO SHORT TOUR HISTORY            )
      PRINT 303,(IBAUSN(I),I=1,LAUS)
      PRINT 308
  308 FORMAT(40H0 RA PEOPLE WITH NO SHORT TOUR HISTORY            )
      PRINT 303,(IBRAN(I),I=1,LRA)
      PRINT 309
  309 FORMAT(30H0AUS PERMANENT NONDEPLOYABLES     )
      PRINT 303,(IBAUS(I),I=1,LAUS)
      PRINT 310
  310 FORMAT(30H0RA PERMANENT NONDEPLOYABLES      )
      PRINT 303,(IBRA(I),I=1,LRA)
      PRINT 312
      PRINT 323
      PRINT 313,NT,NKAS,NL,IOUT,NEW(NT),IPNDPL,JRET,JST,NOTH,JTOT,NEDE,N
     1EEW(NT),NNEW
  313 FORMAT(1H I9,12I10)
  137 CONTINUE
C IF PRINTER CONTROL=0,PRINT SUMMARY LINE.
      IF(JUMP1)100,317,100
  317 PRINT 313,NT,NKAS,NL,IOUT,NEW(NT),IPNDPL,JRET,JST,NOTH,JTOT,NEDE,N
     1EEW(NT),NNEW
  100 CONTINUE
      DO 503 I=1,24
      J=I+LT+1
  503 NEEW(I)=NEEW(J)
      PRINT 504
  504 FORMAT(50H0ADDITIONAL TRAINEES AT MONTH OF ENTRY TO AIT          )
      PRINT 303,(NEEW(I),I=1,24)
```

```
      GO TO 101
  140 PRINT 142,SAMP
  142 FORMAT(8H1SAMPLE   A8,49H PRESENTS PROBLEMS NOT IN THE SCOPE OF THE
     1 MODEL                         )
      GO TO 101
  999 STOP
      END
```

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APPENDIX A-2. SAMPLE PROBLEM, WITH ILLUSTRATIVE TABLES

Sample input used for the sample problems is listed below. The two batch cards for the output shown were: Card 1, the format used by the computer to read card 2 of the sample cards (5XF5.3,5XF5.3) and Card 2, the temporary monthly nondeployability factor for trainees not sent to short tour directly after AIT school, for this example cols 8-10 and 18-20 contained 881.

Data were punched in the sample cards as follows

Sample Cards

Fields	1	2	3	4
1-6	000	000	000	000
7-12	726	5956	7358	628
13-18	388	6919	5259	618
19-24	186	7918	7800	820
25-30	444	8058	3797	Blank
31-36	5956	8058	3797	
37-42	398	27	2	
43-48	186		35	
49-54	61		870	
55-60	13		0 1 2	for summary only for starting matrices and monthly vectors for monthly matrices and vectors
61-66	17082		Blank	

Table A-2(1). SUMMARY SHEET

Sample computer output appears in Tables A-2(1), (2), and (3). Table A-2(1) is the summary sheet obtained if a zero is put in column 55, card 2 of the sample data cards appearing in Step 2 of the flow chart (Figure 4 of the main report). An explanation of the meaning of the column headings and the line at the bottom of the table follows:

(1) Month Month of projection from the starting inventory

(2) CAS Number of casualties lost from the short tour

(3) OTH ATTN. Other attrition losses from all parts of the system

(4) END TERM. Number of people ending their first enlistment and leaving the system

(5) SCHD INPT. Scheduled input: historical record of trainees scheduled to enter the system in the next few months and planned input for the more distant part of the projection

(6) PERM NDPL. Permanently nondeployable: sum of hard core nondeployable and those nearing the end of their enlistment

(7) RET. Returnees from the short tour who have not finished their enlistment

(8) IN ST. Total number actually in short tour

(9) W/O ST. All besides permanently nondeployable who have not yet been to short tour

(10) SYST TOT. Grand total of all people in the system

(11) ST INPT. Additional replacements required by short tour besides those available from scheduled input and existing assets

(12) AIT INPUT. Gross number required to be started to MOS school to furnish the net of ST INPT

(13) MODEL INPT. Number used by the model to furnish ST INPT. Model starts with AIT output

(14) Additional trainees at month of entry to AIT - Gross number started to AIT (col. 12) set back by the length of the AIR school plus one month, to allow for leave before assignment to short tour

Table A-2(1)

SUMMARY SHEET

(1) MONTH	(2) CAS	(3) OTH ATTN	(4) END TERM	(5) SCHD INPT	(6) PERM NDPL	(7) RET	(8) IN ST	(9) W/O ST	(10) SYST TOT	(11) ST INPT	(12) AIT INPT	(13) MODEL INPT
1	31	75	759	1055	3937	963	6117	6255	17272	0	0	0
2	22	68	786	1056	3882	1238	6278	6054	17452	0	0	0
3	23	69	781	754	3798	1512	6439	5584	17333	0	0	0
4	25	68	776	755	3685	1782	6600	5152	17219	0	0	0
5	25	60	774	754	3559	2049	6761	4745	17114	0	0	0
6	25	60	768	755	3418	2287	6919	4392	17016	0	0	0
7	32	58	764	754	3256	2522	7085	4053	16916	0	0	0
8	27	59	732	755	3066	2516	7251	4020	16853	0	0	0
9	29	61	730	1119	2891	2509	7417	4335	17152	0	0	0
10	31	62	725	1119	2768	2502	7583	4600	17453	0	0	0
11	29	65	722	1119	2663	2495	7749	4849	17756	0	0	0
12	25	68	720	1119	2635	2489	7918	5020	18062	0	0	0
13	27	72	694	1119	2649	2877	7941	4921	18388	0	0	0
14	26	77	695	1119	2708	3220	7964	4817	18709	0	0	0
15	25	84	691	519	2708	3546	7987	4187	18428	0	0	0
16	25	83	686	519	2754	3842	8010	3599	18205	41	61	52
17	26	78	683	519	2763	4105	8033	3129	18030	74	109	93
18	26	77	680	520	2653	4313	8058	2823	17847	63	93	80
19	28	80	673	519	2528	4498	8058	2557	17641	45	66	56
20	28	78	954	520	2334	4272	8058	2437	17101	0	0	0
21	27	73	930	519	2208	4112	8058	2212	16590	0	0	0
22	26	67	924	519	2029	4030	8058	1975	16092	0	0	0
23	25	60	716	519	1902	4112	8058	1783	15855	35	52	45
24	24	58	716	520	1725	4222	8058	1659	15664	69	102	87
25	27	57	659	519	1659	4575	8058	1553	15845	320	473	405
26	27	57	647	520	1706	4813	8058	1466	16043	324	478	409
27	29	59	653	520	1731	5056	8058	1419	16264	350	517	442

(14) ADDITIONAL TRAINEES AT MONTH OF ENTRY TO AIT

0	0	0	0	0	0	0	0	0	0	0	0
61	109	93	66	0	0	0	52	102	473	478	517

Table A-2(2). SAMPLE OUTPUT
(Monthly Vectors)

Table A-2(2) is a sample of output for a month if a 1 is put in column 55 of card 2. Explanation of the meaning of the row headings and summary line is given below.

(1) AUS SHORT TOUR — A vector 12-months long showing the length of stay in short tour (and the replacement schedule). This vector is actually the border sums of matrix IAUS(I,J) summed over I

(2) RA SHORT TOUR — Same as (1) for IRA

(3) AUS RETURNEES — AUS people who have returned to base from short tour. The position in the vestor denotes the time already served in the enlistment term. (Since the model starts with basic training and MOS training already accomplished, the duration of commitment for AUS people is 24-2-LT where LT is the duration of AIT, in the example, 24-2-2 or 20 months.)

(4) RA RETURNEES — Same as (3) for RA people

(5) AUS PEOPLE WITH NO SHORT TOUR HISTORY — Self-explanatory; position in vector gives position in enlistment

(6) RA PEOPLE WITH NO SHORT TOUR HISTORY — Same as (5) for RA people

(7) AUS PERMANENT NONDEPLOYABLES — Position in vector gives duration of service. Includes people from (5) who are nearing the end of their service.

(8) RA PERMANENT NONDEPLOYABLES — Same as (7) for RA

(9) Line of summary table described inthe section about Table A-2(1).

Table A-2(2)

SAMPLE OUTPUT
(Monthly Vectors)

MOS 00

MONTH 24

(1) AUS SHORT TOUR												
	474	449	429	386	386	509	535	565	577	683	676	669
(2) RA SHORT TOUR												
	132	130	133	129	124	173	191	210	229	92	84	93
(3) AUS RETURNEES												
	0	0	0	0	0	0	0	0	0	0	0	0
	0	550	522	503	439	436	433	321				
(4) RA RETURNEES												
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	19	17	88	67	68	67	87	92
	93	56	60	60	60	60	60	64				
(5) AUS PEOPLE WITH NO SHORT TOUR HISTORY												
	425	78	69	61	59	54	54	48	43	38	67	65
	0	0	0	0	0	0	0	0				
(6) RA PEOPLE WITH NO SHORT TOUR HISTORY												
	77	14	13	12	12	11	11	10	9	8	32	36
	24	59	53	52	33	33	9	16	16	16	22	20
	0	0	0	0	0	0	0	0				
(7) AUS PERMANENT NONDEPLOYABLES												
	15	30	23	15	15	15	24	29	31	24	33	33
	100	156	175	201	87	92	97	214				
(8) RA PERMANENT NONDEPLOYABLES												
	3	5	4	2	2	2	4	5	5	4	5	5
	5	5	5	5	3	3	3	3	3	3	5	5
	23	23	24	26	28	30	34	34				

	MONTH	CAS	OTH ATTN	END TERM	SCHD INPT	PERM NDPL	RET	IN ST	W/O ST	SYST TOT	ST INPT	AIT INPT	MODEL INPT
(9)	24	24	58	716	520	1725	4222	8058	1659	15664	69	102	87

Table A-2(3). SAMPLE OUTPUT
(Starting Matrices)

Table A-2(3) shows the starting data after the inventory has been spread into workable position for projection by the computer. The same information is shown here as in Table A-2(2) except that the full IAUS and IRA matrices are shown instead of the column sums. No summary line appears to parallel (9) in Table A-2(2). Instead, vectors appear showing the scheduled monthly input (after completed AIT) and the short tour quotas. This starting information is output with the use of a 1 or 2 in col. 55 of card 2. If a 2 is used, the full IAUS and IRA matrices are output for each month of the projection. These are useful for understanding the process of projection, but are bulky and time consuming. The summary sheet (Table A-2(1) contains the information essential for most analyses.

Table A-2(3)

SAMPLE OUTPUT
(Full Matrices)

MOS 00 STARTING POSITION

(1) AUS SHORT TOUR

0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0
0	216	0	0	0	0	0	0	0	0	0	0
0	0	216	0	0	0	0	0	0	0	0	0
0	0	0	216	0	0	0	0	0	0	0	0
0	0	0	0	216	0	0	0	0	0	0	0
0	0	0	0	0	216	0	0	0	0	0	0
0	0	0	0	0	0	216	0	0	0	0	0
0	0	0	0	0	0	0	234	0	0	0	0
0	0	0	0	0	0	0	0	234	0	0	0
0	0	0	0	0	0	0	0	0	234	0	0
0	0	0	0	0	0	0	0	0	0	234	0
0	0	0	0	0	0	0	0	0	0	0	234
0	0	0	0	0	234	0	0	0	0	0	0
0	0	0	0	0	0	234	0	0	0	0	0
0	0	0	0	0	0	0	234	0	0	0	0
0	0	0	0	0	0	0	0	234	0	0	0
0	0	0	0	0	0	0	0	0	234	0	0
0	0	0	0	0	0	0	0	0	0	234	0
0	0	0	0	0	0	0	0	0	0	0	234
216	216	216	216	216	450	450	468	468	468	468	468

(2) RA SHORT TOUR

0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0
0	39	0	0	0	0	0	0	0	0	0	0
0	0	39	0	0	0	0	0	0	0	0	0
0	0	0	39	0	0	0	0	0	0	0	0
0	0	0	0	39	0	0	0	0	0	0	0
0	0	0	0	0	39	0	0	0	0	0	0
0	0	0	0	0	0	39	0	0	0	0	0
0	0	0	0	0	0	0	65	0	0	0	0
0	0	0	0	0	0	0	0	65	0	0	0
0	0	0	0	0	0	0	0	0	65	0	0
0	0	0	0	0	0	0	0	0	0	65	0
0	0	0	0	0	0	0	0	0	0	0	65
65	0	0	0	0	0	0	0	0	0	0	0
0	65	0	0	0	0	0	0	0	0	0	0
0	0	65	0	0	0	0	0	0	0	0	0
0	0	0	65	0	0	0	0	0	0	0	0
0	0	0	0	65	0	0	0	0	0	0	0
0	0	0	0	0	65	0	0	0	0	0	0
0	0	0	0	0	0	65	0	0	0	0	0
0	0	0	0	0	0	0	48	0	0	0	0
0	0	0	0	0	0	0	0	49	0	0	0
0	0	0	0	0	0	0	0	0	49	0	0
0	0	0	0	0	0	0	0	0	0	49	0
0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	49	0	0	0	0	0	0
0	0	0	0	0	0	49	0	0	0	0	0
0	0	0	0	0	0	0	49	0	0	0	0
0	0	0	0	0	0	0	0	48	0	0	0
0	0	0	0	0	0	0	0	0	49	0	0
0	0	0	0	0	0	0	0	0	0	49	0
0	0	0	0	0	0	0	0	0	0	0	49
104	104	104	104	104	153	153	162	162	163	163	162

Table A-2(3) continued

(3) AUS RETURNEES

0	0	0	0	0	0	0	0	0	0	0	0
0	55	55	55	56	55	56	26				

(4) RA RETURNEES

0	0	0	0	0	0	0	0	0	0	0	0
0	11	11	11	11	11	11	5	31	31	31	31
31	10	10	10	10	10	11	7				

(5) AUS PEOPLE WITH NO SHORT TOUR HISTORY

893	319	320	320	319	320	320	320	346	347	346	347
0	0	0	0	0	0	0	0				

(6) RA PEOPLE WITH NO SHORT TOUR HISTORY

162	57	58	58	58	58	58	58	96	96	96	96
96	96	97	96	96	96	96	97	72	72	72	72
0	0	0	0	0	0	0	0				

(7) AUS PERMANENT NONDEPLOYABLES

21	21	21	21	21	21	21	21	22	22	22	22
368	369	368	370	368	369	368	370				

(8) RA PERMANENT NONDEPLOYABLES

3	4	4	4	4	3	4	4	6	6	6	6
6	6	6	6	6	6	6	7	5	5	5	5
77	77	77	77	77	77	77	78				

(9) SCHEDULED MONTHLY INPUT

1055	1056	754	755	754	755	754	755	1119	1119	1119	1119
1119	1119	519	519	519	520	519	520	519	519	519	520

(10) MONTHLY QUOTAS FOR SHORT TOUR

6117	6278	6439	6600	6761	6919	7085	7251	7417	7583	7749	7918
7941	7964	7987	8010	8033	8058	8058	8058	8058	8058	8058	8058